

**REMARKS**

In accordance with the foregoing, claims 15, 17-19, and 29-32 are amended. Claims 15, 17-19, and 26-32 are pending and under consideration.

The following amendments and remarks are respectfully submitted. Reconsideration of the claims is respectfully requested.

**I. Rejection under 35 U.S.C. § 112**

In the Office Action, claims 15, 17-19, and 26-32 were rejected under the second paragraph of 35 USC § 112 as being indefinite. Various claims have been amended in response to this rejection. Accordingly, withdrawal of the § 112 rejection is respectfully requested.

**II. Rejection under 35 U.S.C. § 103**

The instant Office Action rejects claims 15 and 17-19 under 35 U.S.C. § 103 over various combinations of:

1. U.S. Patent 5,658,530 to Dunn (hereinafter “Dunn”)
2. JP2000-327315 to Wakamura et al. (“Wakamura1”),
3. U.S. Patent No. 5,614,568 to Mawatari et al. (“Matawari”),
4. U.S. Patent No. 4,367,312 to Bontinck et al. (“Bontinck”),
5. U.S. Patent No. 6,004,667 to Sakurada et al. (“Sakurada1”),
6. JP11343210 to Sakurada (“Sakurada2”)
7. JP03275627 to Saito (“Saito”),
8. U.S. Patent No. 5,981,425 to Taoda et al. (“Taoda”),
9. JP07-100378 to Kato (“Kato”),
10. WO0046153 to Imura et al. (“Imura”),
11. JP2001-302220 to Wakamura (“Wakamura2”), and
12. JP63023744 to Shimazaki (“Shimazaki”).

These rejections are respectfully traversed.

Claim 15, for example, provides a method for preserving food including bringing food into contact with sintered Ti-modified calcium hydroxyapatite for storage. The Ti-modified calcium

hydroxyapatite has part of calcium in calcium hydroxyapatite substituted with titanium, and the Ti-modified calcium hydroxyapatite is sintered at 580 to 660°C. The food is brought into contact with the sintered Ti-modified calcium hydroxyapatite by putting the food in a container having an inner surface coated with the sintered Ti-modified calcium hydroxyapatite or in a container made of a material containing the sintered Ti-modified calcium hydroxyapatite.

To begin with, it is submitted that the Examiner's proposed combination teaches away from the claimed method. MPEP 2144.05 ("Obviousness of Ranges") states that "*prima facie* case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997)."

The Examiner concedes that Dunn does not teach the use of Ti-modified calcium hydroxyapatite ("Ti-CaHAP") and relies on Wakamura1 as disclosing the use of Ti-CaHAP. The Examiner further concedes that the combination of Dunn and Wakamura1 does not teach that the Ti-CaHAP is sintered at 580 to 660°C and relies on Saito as disclosing this feature. The Examiner has taken the position that it would have been obvious to combine the teachings of Dunn and Wakamura1 with those of Saito, since Saito teaches that heating of a metal modified calcium hydroxyapatite results in improved fixing of the metal onto the hydroxyapatite. This motivation is improper.

The Examiner's attention is drawn to paragraph [0013] of the translation of Wakamura1, which states:

As opposed to the above-cited prior art wherein the production of a titanium oxide film by the sol-gel method necessitates high-temperature heat treatment at about 500°C for turning titanium oxide into crystalline structure as required to impart catalytic activity, the present invention adopts an ion exchange method based on the co-precipitation method wherein the metal oxide produced without any heat treatment is non-crystalline but yet exhibits excellent photocatalytic activity.

Thus, the disclosure of Wakamura1 clearly rejects the adoption of high-temperature heat treatment that was conventionally used for heat-treating titanium oxide, and instead adopts heat treatment at 100°C (see paragraph [0019]). Thus, Wakamura1 actually teaches away from the disclosure in Saito of heating to 600°C. In other words, one of ordinary skill in the art at the time of the invention would not have been motivated to combine the teachings of Dunn and Wakamura1 with those of Saito because the combined method of Dunn and Wakamura1 clearly teaches a low-temperature heat treatment in the range of 100°C and Saito teaches a high-temperature heat treatment in the range of 600°C. Again, Wakamura1 is the only reference

relied on by the Examiner that discloses the use of Ti-CaHAP, thus, one of ordinary skill in the art at the time of the invention would not have been motivated to combine the teachings of Dunn and Wakamura1 with the teachings of references not disclosing Ti-CaHAP for the purpose of the claimed method of high-temperature heat treatment of Ti-CaHAP at 580 to 660°C.

Furthermore, the Examiner has not included a finding that results flowing from the result of the proposed combination of Dunn and Wakamura1 and Saito would have been predictable to one of ordinary skill in the art.

MPEP 2144.05 ("Obviousness of Ranges") further states that "applicant can rebut a presumption of obviousness based on a claimed invention that falls within a prior art range by showing "(1) [t]hat the prior art taught away from the claimed invention...or (2) that there are new and unexpected results relative to the prior art." *Iron Grip Barbell Co., Inc. v. USA Sports, Inc.*, 392 F.3d 1317, 1322, 73 USPQ2d 1225, 1228 (Fed. Cir. 2004)."

As Applicant has repeatedly pointed out, the claimed method has arisen from a finding that the antibacterial effect of Ti-CaHAP is unexpectedly enhanced by preliminary sintering at 580 to 660°C in comparison with non-sintered or otherwise sintered Ti-modified calcium hydroxyapatite. A comparison of Example 3 (sintered) to Example 1 (non-sintered) and Example 4 (sintered) to Example 2 (non-sintered) in the specification provides experimental support for this unexpected enhancement. From Fig. 3 of the specification, note that sintered Ti-CaHAP provides a higher antibacterial effect than non-sintered Ti-CaHAP, in spite of the fact that Ti-CaHAP is otherwise the same in Examples 1-4.

In view of the above discussion, it is submitted that the Examiner has not established a *prima facie* case of obviousness and has not provided a proper motivation for combining the references in rejecting independent claim 15.

Furthermore, none of the remaining relied upon references make up for the deficiencies in Dunn and Wakamura1 and Saito discussed above with respect to claim 15. A brief discussion of some of these additional references is provided below.

Like, Wakamura1, Wakamura2 discloses Ti-CaHAP that is formed by aging at 100°C and drying at 70°C (paragraph 0021). Further, Wakamura2 discloses the avoidance of heating at high temperatures of about 500°C (paragraph 0012). Therefore, Wakamura2 is also considered to teach away from the teachings of Saito and the method of claim 15 for at least the reasons discussed above.

Mawatari fails to teach Ti-CaHAP (see claim 1, failing to set forth Ti). Mawatari merely teaches calcium hydroxyapatite as an example of support for a metal catalyst, such as silver (column 7, lines 25-49), not Ti-CaHAP, wherein calcium in calcium hydroxyapatite is substituted with titanium. Further, sintering or calcination (at 800°C) in Mawatari is performed only for strengthening the bonding of silver on the calcium hydroxyapatite support (column 7, lines 43-49), but not for enhancing the photocatalytic activity of Ti-CaHAP.

Shimazaki merely teaches a mixture of hydroxyapatite (partially substituted with an alkali metal or alkali earth metal) and an oxide or composite oxide of an element selected from Mg, Sr, Ba, B, Si, P, Ti, Zr, Nb, Mo, Ta, W, Bi and Co (abstract). Shimazaki, like the prior art documents discussed above, also fails to teach or suggest Ti-CaHAP wherein calcium in calcium hydroxyapatite is substituted with titanium, let alone sintering of Ti-CaHAP at 580 to 660°C for enhancing photocatalytic activity of the Ti-modified calcium hydroxyapatite.

Sakurada1 merely teaches combination of a photocatalytic film made of TiO<sub>2</sub>, for example, with adsorbent such as hydroxyapatite (column 6, lines 49-63). Thus, Sakurada1 fails to teach or suggest Ti-CaHAP wherein calcium in calcium hydroxyapatite is substituted with titanium, let alone sintering of Ti-CaHAP at 580 to 660°C for enhancing photocatalytic activity of the Ti-modified calcium hydroxyapatite.

Sakurada2 merely teaches combination of photocatalytic powder (e.g. TiO<sub>2</sub>), metal powder (e.g. gold, silver) and an adsorbent material such as hydroxyapatite (abstract). Thus, Sakurada2 fails to teach or suggest Ti-CaHAP wherein calcium in calcium hydroxyapatite is substituted with titanium, let alone sintering of Ti-CaHAP at 580 to 660°C for enhancing photocatalytic activity of the Ti-modified calcium hydroxyapatite.

Sakuma merely teaches dentrifrice (tooth paste or powder) that comprises calcium hydroxyapatite supporting or combining with an antibacterial metal. However, enumerated examples of antibacterial metal includes Ag, Zn and Cu only. Further, Sakuma et al adopts a sintering temperature of no less than 800°C (column 2, lines 25-49) which is far higher than the claimed range, as already noted by the Examiner. Sakuma et al also fails to teach or suggest Ti-CaHAP wherein calcium in calcium hydroxyapatite is substituted with titanium, let alone sintering of Ti-CaHAP at 580 to 660°C for enhancing photocatalytic activity of the Ti-modified calcium hydroxyapatite.

Independent claims 17-19 recites features similar to those recited in claim 15, such that claims 17-19, and dependent claims 26-32, are patentable over the cited references for at least the reasons discussed above.

**CONCLUSION**

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

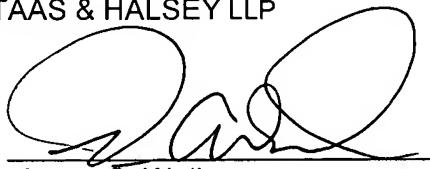
Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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